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RESEARCH ARTICLE

PERFORMANCE ANALYSIS AND SIMULATION OF AODV, DSR ROUTING PROTOCOLS IN VANET TO IMPROVE ITS

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Abstract

The paper is to identify which ad hoc routing method has better performance used to improve an intelligent transportation system in VANET. .In this paper, AODV (ad hoc on demand distance vector) routing protocols and DSR (dynamic source routing) routing protocols are used to measure the performance of various parameters like throughput , PDR(packet delivery ratio),Jitter, Total energy consumption and end to end delay in vehicular Ad hoc network (VANET) to improve ITS(intelligent transportation system). Here AODV router protocol is giving better performance of throughput , PDR(packet delivery ratio),Jitter and delay. as compare to DSR and other routing protocols in VANET. VANET is the design of an effective MAC (Medium Access Control) which can facilitate the fast and reliable dissemination of critical safety messages to Neighboring vehicles in case of an unexpected event. Broadcasting of data and control packets is expected to be crucial in vehicular environment .Most of the broadcasting packet is designed to be delivered on a given frequency during the control channel (CCH) interval set by the IEEE 802.11p MAC standard which provides enhancements to multi-channel. VANET can decide the routing protocol which will give the better values of parameters measurement to control the congestion and improve the intelligent transportation systems (ITS)[in terms of increased number of vehicles and/or increased amount of data traffic injected without collapsing.TCP (Transmission Control Protocol) and UDP (User Datagram Protocol) traffic are two different traffic pattern used in this thesis to generate Random Traffic for VANET. And the better traffic type is used for the further performance evaluation of different ad hoc routing protocols for VANET.

Introduction:-

Vehicular ad hoc network routing protocols can be divided into proactive, reactive and hybrid [2] . A proactive routing protocol is also called "table driven" routing protocol. Using a proactive routing protocol, nodes in a vehicular ad hoc network continuously evaluate routes to all reachable nodes and attempt to maintain consistent, up-

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to-date routing information [4]. Therefore, a source node can get a routing path immediately if it needs one. In proactive routing protocol, all nodes need to maintain a consistent view of the network topology. When a network topology changes, respective updates must be propagated throughout the network to notify the change .To avoid this problem, reactive routings protocols are used in vehicular ad hoc network(VANET) The Dynamic Source Routing (DSR) and Ad hoc on-demand Distance Vector routing (AODV) protocol are examples for reactive routing protocol.[6]

AODV routing protocol works purely on demand basis when it is required by network, which is fulfilled by nodes within the network. Route discovery and route maintenance is also carried out on demand basis even if only two nodes need to communicate with each other. AODV cuts down the need of nodes in order to always remain active and to continuously update routing information at each node.

Dynamic Source Routing protocol (DSR) [5], designed for multi-hop wireless ad hoc networks. This protocol consists of two operations "Route Discovery" and "Route Maintenance" that makes it self configuring and self-organizing. The routes from source node to destination is determined by route discovery phase. In DSR routing protocol, the routing information of all intermediate nodes to arrive at a particular destination are stored in the header of data packets. Routing information of each & every source node can be altered at any time in the network and DSR updates it afterwards each change occur [5].

By using these two routing protocols, we measured throughput, packet delivery ratio ,jitter, total energy consumption and end to end delay of VANET. While measuring these parameters, we used UDP (user datagram protocol) protocol to send the packet to destination without any acknowledgement from the receiver node.TCP (transmission control protocol) protocol is used to take an acknowledgement from receiver node.[7]

We measured throughput, packet delivery ratio ,jitter, total energy consumption and end to end delay of VANET by considering the number of nodes 5,10,15,20,25,30,40,50 with two routing protocol i.e. AODV and DSR. And finally, we decided the betterment of these routing protocols with particular parameter to improve our intelligent transportation system.(ITS).[8]

Related work:-
Several researchers have studied and analyzed various ad-hoc Routing Protocols taking into consideration different metrics as basis for performance evaluation. They have used different simulators and real-world environment for the same.

A. A. A. Radwan, T. M. Mahmoud and E. H. Houssein(2011) [5] have explained these type of routing protocols are also known as On Demand routing protocols because it establish a route from source to destination whenever a node has something to send thus reducing burden on network. Reactive routing have route discovery phase where network is flooded in search of destination. There are different types of Reactive routing protocols like AODV, DSR.

Perkins. C,C. [7].studied and compared the performance of DSDV, AODV and DSR routing protocols for ad hoc networks using ns-2 simulations on different pause times. In this , it was conveyed that with pause time set to 0 the packet delivery ratio of AODV and DSR were almost same with 97% to 99%. With increase in pause time to 200s, the packet delivery ratio of AODV and DSR reached 100% approximately. DSR performed well with low end to end delay for 0 pause time. Overall performance of DSR was found to be better than AODV.

C. E Perkins, E. M. Royers, [8] have compared and analyzed the performance of AODV and DSR using random way point mobility model with variable pause time using ns-2 simulator and found that DSR outperformed AODV in delay and throughput on less stressful situation i.e., with small number of nodes and lower load and mobility while AODV out performed DSR in more load, high mobility. They also found that DSR low throughput and delay was due to aggressive use of caching and stale routes.

P. Bakalis and B. Lawal [9]studied the behavior of AODV and DSR over TCP and CBR (Constant Bit Rate) connection with varying speed and node density using random waypoint mobility model and ns-2 simulator. They found that in low density with low speed the packet delivery ratio (PDR) of TCP and CBR connection for both protocols is high while end to end delay (E-To-E) is high for TCP connection but low for CBR. With high speed

PDR for AODV using TCP is average but high for DSR. In high density with low speed, PDR of TCP and CBR connection for AODV was average but high for DSR. If the speed was high the PDR for AODV and DSR using CBR was low, but using TCP AODV performed average and DSR performs high. Performance of both AODV and DSR outperformed each other based on the different traffic pattern.

Davesh Singh Som, Dhananjaya Singh [10] In this paper authors analyzed the performance of AODV and DSR routing protocols for Vehicular Ad-hoc network with and without RSU (Road Side Unit). For performance evaluation of considered protocols they used Estinet Simulator. After getting simulation results they conclude that throughput was highest for AODV as compared to DSR with varying number of nodes so AODV performed better than DSR. They also found that in presence of RSU whole performance of network was better as compared to absence of RSUs.

Perkins and E. M. Royer [11] In this paper authors analyzed the performance of AODV and DSR routing protocols using ns-2 simulator with Random Waypoint mobility model. After getting simulation results they conclude that packet loss of DSR is higher as compared to AODV and ratio of packet received was higher for AODV as compared to the DSR routing protocol.

Simulations:-

In this paper , AODV and DSR routing protocols are used to determine the throughput ,packet delivery ratio ,jitter ,total energy consumption and delay. These all parameters are determined by considering the no of nodes 5,10,15,20,25,30,40 and 50 at the congestion area. Network simulator-2 (NS-2) is used to simulate the road scenario and congestion . LINUX is used as operating language with fedora version.[4]

Omni directional antenna is used to broadcast the packets from source to destination. TCP (Transmission Control Protocol) and UDP (User Datagram Protocol) traffic are two different traffic pattern used to generate Random Traffic for VANET. The system flow chart as shown in figure 1.

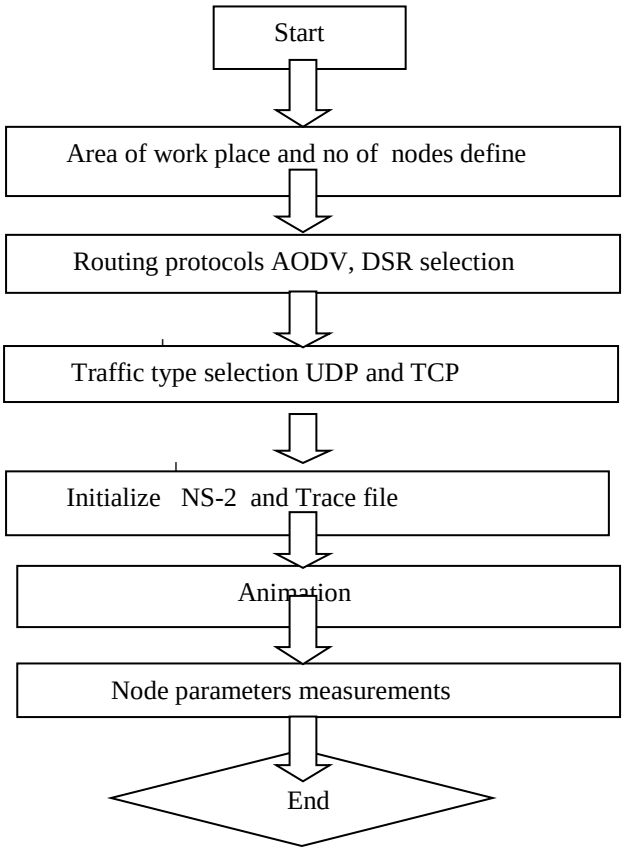

Fig.1:- System Flowchart.

Visualization and Analysis:-

We visualize different parameters graphically by using AODV and DSR routing protocol as shown in figure no 2 to figure no7.

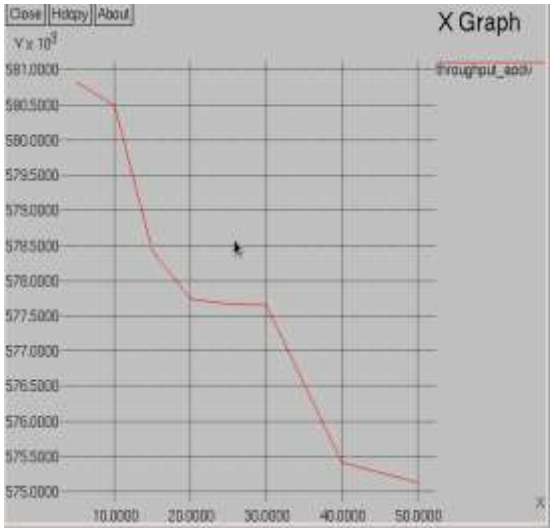

Fig 2:- Throughput v/s No. of nodes(AODV)

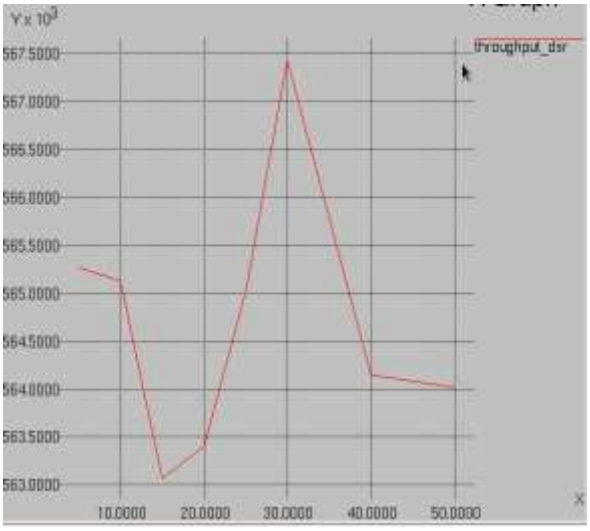

Fig 3:- Throughput v/s No. of nodes(DSR)

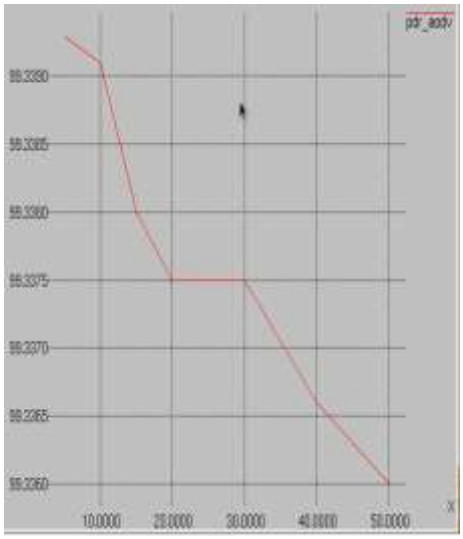

Fig 4:- PDR v/s No. of nodes (AODV)

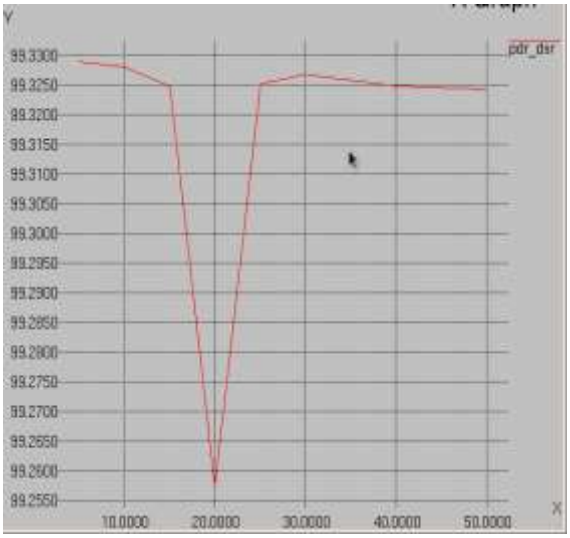

Fig 5:- PDR v/s No. of nodes (DSR)

Fig 6:- Jitter v/s No. of nodes (AODV)

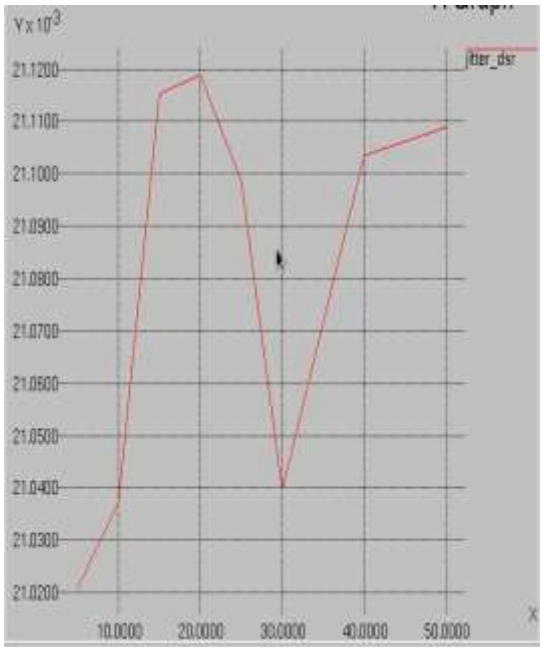

Fig 7:- Jitter v/s No. of nodes (DSR)

Table 1:- Parameters measured by AODV.

No of nodes	Throughput	PDR	Jitter
05	580820	99.3393	0.0206993
10	580489	99.3391	0.0207033
15	578425	99.3380	0.0207407
20	577740	99.3375	0.0201495
25	577663	99.3375	0.0207511
30	577655	99.3375	0.0207506
40	575417	99.3366	0.0207879
50	575130	99.3360	0.0207881

Table 2:- Parameters measured by DSR

No of nodes	Throughput	PDR	Jitter
05	565271	99.3289	0.0210208
10	565130	99.3280	0.0210371
15	563070	99.3248	0.0211152
20	563405	99.2573	0.0211189
25	565037	99.3252	0.0210987
30	567434	99.3268	0.0210396
40	564144	99.3248	0.0211034
50	564014	99.3243	0.0211089

Conclusion:-

From graph results it is observed that DSR shows less throughput and packet delivery ratio as compare to AODV protocol as the no. of nodes are increased., which make it slower to determine the least congested route. In AODV, every destination replies to only first RREQ. that as the number of node increases AODV performs better than DSR, due to the route discovery process is very fast. the performance on the basis of throughput with varying number of nodes. Here we see that AODV shows very high average throughput as compared to DSR that shown in figure. Because AODV is highly reliable in terms of large-scale environment and high-speed..also the jitter of DSR protocol is higher than AODV protocol. Finally, It is concluded that, the overall performance of AODV routing protocol is better than DSR routing protocol as the number of nodes are increased.

Here we see that AODV shows very high average throughput as compared to DSR. Because AODV is highly reliable in terms of large-scale environment and high-speed .A substantial effort is done to improve the neighbor expiry time. Now recent routes will not be used by the node because on expiry of neighbors it will invalidate all the routes to those neighbors. Maintenance of table is for less time as compared to AODV. Moreover the concept of packet salvaging proved to be very efficient in repairing a faulty node. These improvements resulted in increased throughput, increased packed delivery ratio.

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